

BEN calculates the benefit a violator accrues from delaying a capital investment, delaying a one-time expenditure, and avoiding any annual costs over the period of noncompliance. BEN requires 13 data items to calculate the economic benefit of delay, including the case name and certain other information about the case (see Exhibit 1-2 in Chapter 1).²⁷ You must supply the case name and Variables 2 through 7. For the remaining six variables, you can either use standard values or specify your own values. Standard values for these remaining six variables are contained in BEN for both for-profit entities (e.g., C-corporations, S-corporations, partnerships, and sole proprietorships), and not-for-profit organizations (e.g., municipalities), and should be used for your computation if you do not have data specific to the violator. You should change a standard value only if you have reliable information substantiating the change. The economic benefit calculation is performed in the same manner whether you use the standard values or specify your own values for the six optional inputs.

This chapter explains each of the variables, in the order in which you enter them in BEN. Sections A and B define the seven required variables detailing the case being analyzed. Sections C and D define the six variables for which standard values are available and explain how the standard values are calculated. Because the standard values differ depending on the profit status and tax filing status of the entity, Section C describes "for-profit" values for both C-corporations and other for-profit entities, and Section D describes "not-for-profit" values. The examples which accompany the explanations are based on a hypothetical "Entity X" and recreate the prompting sequence, item by item, as it appears on your computer screen when you run BEN. An example of a prompt and a user response follows each variable title in a shaded box. The user response is shown in **bold** print. The explanations include a brief description of the criteria you should use in developing the first six input

²⁷ As discussed in Chapter 1, previous versions of BEN contained a variable to account for low-interest financing. Since this variable was only applicable to violations that occurred prior to 1986, this variable has been removed from the current version of BEN.

values and the basis for each of the standard values. Each explanation also contains a statement regarding how a change in the value of each variable will affect the economic benefit of delay (e.g., increase it or decrease it). Exhibit 4-1 summarizes these effects by showing the direction of the change in economic benefit caused by a change in each variable, holding all other variables constant.

Exhibit 4-1
EFFECT OF VARIABLE CHANGES ON ECONOMIC BENEFIT ²⁸

Variable Name		Direction of Variable Change	Change in Economic Benefit
2.	Initial Capital Investment:		
	- Recurring	Increase	Increase
	- Non-recurring	Increase	Increase
3.	One-Time Nondepreciable Expenditure	Increase	Increase
	- Tax-Deductible	Yes No	Decrease ²⁹ Increase
4.	Annual Expenses	Increase	Increase
5.	Date of Noncompliance	Later	Decrease
6.	Date of Compliance	Later	Increase
7.	Date of Penalty Payment	Later	Increase
8.	Useful Life of Pollution Control Equipment	Increase	Decrease
9.	Marginal Income Tax Rate 1986 and Before	Increase	Decrease
10.	Marginal Income Tax Rate 1987 to 1992	Increase	Decrease ³⁰
11.	Marginal Income Tax Rate 1993 and Beyond	Increase	Decrease
12.	Inflation Rate	Increase	Decrease ³¹
13.	Discount Rate	Increase	Increase

To simplify and aid data entry, you might find it helpful to use the Data Entry Form presented in Exhibit 4-2. The form provides space for organizing multiple BEN runs, thus allowing you to plan in advance which inputs you want to vary. To facilitate future BEN analyses, we suggest that you photocopy this page so that you

²⁸ Holding all other variables constant.

²⁹ Tax deductibility of the one-time expense will reduce the economic benefit from what it would be if the expense were not tax deductible.

³⁰ Except in cases as outlined in Footnote 40 on p. 4-14.

³¹ With rare exceptions, as explained under Inflation Rate.

will have a sufficient supply when the need arises.

Before you input the 13 data items, BEN asks you to enter the current date:

ENTER TODAY'S DATE (e.g., FEBRUARY 1, 1997)
FEBRUARY 1, 1997

For this first date, any format may be used. For example, BEN accepts **2/1/97** just as easily as it does **FEBRUARY 1, 1997**. This date will be printed on each page of the results for each calculation you make. You enter the date only once each time you use BEN, even if you make economic benefit calculations for several cases during a single session. If you use the program more than once during the same day, you can add the time of day after the date to differentiate between sessions. Be sure to press the carriage return (or **enter** key) after correctly typing your entry.

BEN then begins prompting you to enter data specific to the penalty case you are analyzing.

Exhibit 4-2

BEN DATA ENTRY FORM

1. A. Case Name:			
B. Profitability Status (Check One): For Profit: _____ Not-for-Profit: _____			
C. Filing Status (Check One): C-corporation: _____ Other than C-corporation: _____			
	Initial Run	2nd Run	3rd Run
2. Initial Capital Investment Dollar-Year One-Time or Recurring?			
3. One-Time Nondepreciable Expenditure Dollar-Year Tax Deductible?			
4. Annual Expenses Dollar-Year			
5. Month, Year of Noncompliance			
6. Month, Year of Compliance			
7. Month, Year of Penalty Payment			
USE STANDARD VALUES? (Yes/No) If No, complete the following:			
8. Useful Life of Capital Investment (years)			
9. Marginal Tax Rate for 1986 and Before			
10. Marginal Tax Rate for 1987 to 1992			
11. Marginal Tax Rate for 1993 and Beyond			
12. Inflation Rate			
13. Discount Rate			
BEN RESULT			

A. REQUIRED VARIABLES (FOR-PROFIT ENTITIES)

1. Case Name, Profitability Status and Filing Status

a. Case Name

1A. PLEASE ENTER THE CASE NAME: ENTITY X EXAMPLE
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After requesting the date, BEN asks for the penalty case name. This name can contain up to 40 characters, including spaces, and will appear along with the date on each page of the results. Since its sole purpose is for your own documentation, this label can contain anything you choose. The label can reflect the violator's name; the name of a specific source, pollution control project, or environmental requirement; or a characteristic of the specific BEN run (e.g., "Compliance in January 1996"). If you are doing multiple runs for the same case, you might find it helpful to vary the case name for each run so that you can more easily distinguish among the various runs. For example, you might title your runs "ABC Corp.: Outfall 1", "ABC Corp.: Outfall 2"; etc.

If you enter nothing for the case name, nothing will be printed where the label normally appears on your results. Be sure to check for misspellings or incorrect dates before pressing the carriage return (or **enter** key), since BEN will accept and print whatever you type for this label.

b. Profitability Status

1B. PLEASE ENTER THE PROFIT STATUS OF THIS ENTITY: 1 FOR-PROFIT (e.g., A BUSINESS) 2 NOT-FOR-PROFIT (e.g., A MUNICIPALITY) PROFIT STATUS: 1
--

Enter **1** if the violator is a profit-making entity or **2** if the violator is not-for-profit. Profit-making organizations can be corporations, partnerships or sole proprietorships. Typical not-for-profit entities include

towns, school districts, sewer or water districts, and counties. Your determination will direct BEN's application of the tax rates and the discount rate.

c. Filing Status

1C. PLEASE ENTER THE FILING STATUS OF THIS ENTITY. THIS WILL DETERMINE THE APPROPRIATE TAX RATE FOR THE VIOLATOR:

- 1 C-CORPORATION
- 2 OTHER THAN C-CORPORATION
- 3 SELECT FOR AN EXPLANATION

[NOTE: NOT ALL ENTITIES THAT HAVE "INCORPORATED" IN THEIR TITLES ARE C-CORPORATIONS.]

FILING STATUS:

1

If you select **1**, for-profit, for Variable 1B, BEN will ask you to enter the filing status of the entity under Variable 1C.³² If you are uncertain of the entity's filing status, type **3**, and BEN will provide the following explanation, and then repeat the data prompt:

A C-corporation files a Federal tax Form 1120 or Form 1120-A. Income of these companies is taxed at corporate income tax rates. All publicly-traded companies are C-corporations; small private firms can also be C-corporations.

For-profit entities may also be S-corporations, partnerships, or sole proprietorships (e.g., a corner grocery store). These entities file Federal tax returns other than 1120 or 1120-A, (e.g., an S-corporation files a Form 1120-S and a Schedule K for each shareholder). The income and expenses of these organizations are divided among the shareholders and reported on their individual income tax returns. Income is therefore taxed at the individual income tax rate.

If you are uncertain of the filing status of this entity, default to the C-corporation rate.

³² Not-for-profit entities are tax-exempt and therefore do not file Federal or State tax returns. Thus, BEN skips Variable 1C if you select "not-for-profit" for Variable 1B.

As noted in the above explanation, a for-profit entity's filing status determines the appropriate tax rate. Later in the data entry process, if you choose the standard value option for Variables 8 through 13, BEN automatically adjusts the tax rate values (Variables 9, 10, and 11) to reflect the filing status of the entity.

2. Initial Capital Investment

a. Cost Data

2. INITIAL CAPITAL INVESTMENT IN POLLUTION CONTROL =
(FOLLOW WITH DOLLAR-YEAR SEPARATED BY BLANK; e.g., 100000 1996)
(ENTER 0 IF THIS COST CATEGORY IS NOT APPLICABLE)

405000 1997

Enter the initial capital investment in pollution control equipment, without commas or dollar signs. The initial capital investment entry is the cost of designing, purchasing, and installing the pollution control equipment necessary to remedy the violations; these are expenditures the violator delayed making. The cost should be followed by a blank, and the year in which the dollars are expressed. Express the dollar-year in four digits.

If you do not enter a dollar-year the first time through the program, BEN assumes that the cost is in compliance-year dollars (i.e., the year compliance was achieved). Enter a zero if there is no initial capital investment.

There is an eight-character limit on cost amounts BEN will accept. If your entry exceeds this limit, BEN prints the following error message and reprompts you for a correct input:

ERROR: INPUT VALUE EXCEEDS THE 8-DIGIT LIMIT. ENTER AGAIN.

In the unlikely case that your costs are greater than \$99,999,999 dollars, you should give BEN all of your costs divided by a factor of 1,000 and rounded to the nearest whole number. You can then multiply the BEN

result by 1,000 to determine the total economic benefit.³³

The initial capital investment should include all depreciable investment outlays necessary to achieve compliance with the environmental regulation or permit. Depreciable capital investments are usually made for things that wear out such as buildings, equipment, or other long-lived assets.³⁴ Typical environmental capital investments include ground-water monitoring wells, stack scrubbers, and wastewater treatment systems.

In estimating capital cost, keep in mind this includes all costs associated with designing, installing, shipping, and purchasing the necessary equipment (including sales tax) and associated facilities to remedy the violations. However, costs clearly not associated with remedying the violations should not be included in this cost input. For example, if the violator is adding additional capacity to handle a waste stream from a new production line, the incremental costs associated with treating the new waste stream should not be included in the BEN run (based on the assumption that the additional capacity for treatment of wastes from new production was not needed to achieve compliance under previous levels of production). Further, if the capital costs involved are avoided (i.e., the violator is not just delaying making the investment, but will never make the investment) you must use the procedure presented in Appendix B.

You also must provide the "dollar-year" for the investment, which is the year the capital cost was incurred or estimated (e.g., the year of a feasibility study detailing environmental compliance costs). If you do not provide a dollar-year, BEN will assume that the costs are in compliance-year dollars (see Variable 6). If you have initial capital investment costs with different dollar-years, you should do separate BEN calculations for each.³⁵ Holding all other inputs constant, the economic benefit from delay will be greater for larger capital investment outlays (See Exhibit 4-1).

b. Type of Costs

³³ This result will not be exact, but will be sufficiently precise given BEN's rounding constraints.

³⁴ Land is not a depreciable capital investment. Land costs should be input as a one-time non-depreciable cost (Variable 3).

³⁵ You can sum the separate BEN calculations to determine total economic benefit, as long as your penalty payment date (Variable 7) is the same in each run. For detailed instructions on combining multiple runs, see Appendix B.

IS THE INITIAL INVESTMENT ONE-TIME OR RECURRING?

- 1. ONE-TIME
- 2. RECURRING

PLEASE ENTER THE APPROPRIATE CODE:

[NOTE: MOST CAPITAL COSTS FOR AIR AND WATER CASES ARE RECURRING]

2

BEN next asks you whether the investment is one-time or recurring. Enter **1** if the capital expenditure is a one-time cost, or **2** if the cost is recurring (i.e., the entity will need to repeat the investment at the end of the asset's useful life). Examples of one-time depreciable expenditures include groundwater monitoring wells or purchase of other equipment to close a RCRA site. In identifying equipment as a one-time purchase, you should be convinced that the equipment will not require future replacement.

Water and air pollution-control equipment are capital investments that are typically assumed to be replaced at the end of their useful lives, since this equipment generally is needed to support the entity's manufacturing activities for the foreseeable future. Recurring capital costs will result in higher BEN results than will one-time capital costs, if all other inputs are the same. Note that the entire capital cost usually recurs. This is because when the equipment needs to be replaced, design and installation costs will be incurred again as will the cost of new equipment.

If some of your capital investments are one-time and others are recurring, you will need to categorize them as such and make separate BEN calculations for the two categories. You can add together the results from the two calculations to determine the total economic benefit. (See Appendix B.)

3. One-Time Nondepreciable Expenditures

a. Cost Data

Enter one-time, nondepreciable delayed expenditures followed by the appropriate dollar-year. Enter a zero if there is no one-time expenditure.

3. ONE-TIME NONDEPRECIABLE EXPENDITURE =
(FOLLOW WITH DOLLAR-YEAR SEPARATED BY BLANK; e.g., 100000 1996)
(ENTER 0 IF THIS COST CATEGORY IS NOT APPLICABLE)

210000 1997

The entry for this variable includes delayed expenditures the violator should have made earlier (to prevent the violations) which need only be made once and are non-depreciable (i.e., do not wear out). Such an expenditure could be purchasing land, setting up a record-keeping system, removing illegal discharges of dredged and fill material, disposing of soil from a hazardous-waste site, or initial training of employees.³⁶ As in the case of the initial capital investment, BEN will use the compliance year if you do not provide a dollar-year. The economic benefit increases as the value for this variable increases because the violator has delayed paying a larger amount

³⁶ If training or record keeping must occur over time and regularly, rather than as a one-time effort, these costs should be included in Annual Expenses (Variable 4).

of money. If the one-time nondepreciable costs are avoided, rather than delayed, you must use the procedures outlined in Appendix B to calculate economic benefit.

b. Tax Deductibility

BEN then asks whether the one-time nondepreciable expenditure is tax deductible:

IS THE ONE-TIME EXPENSE TAX-DEDUCTIBLE? (Y/N)
[NOTE: MOST EXPENSES ARE TAX-DEDUCTIBLE]
Y

You should answer yes (Y) or no (N). Most one-time expenditures are tax-deductible; with the primary exception being purchases of land.³⁷ For any expenditure amount, the economic benefit will be smaller if the expenditure is tax-deductible (see Exhibit 4-1).

4. Annual Expenses

4. ANNUAL EXPENSE = (FOLLOW WITH DOLLAR-YEAR SEPARATED BY BLANK; e.g., 100000 1996) (ENTER 0 IF THIS COST CATEGORY IS NOT APPLICABLE)
85750 1997

Enter the annual, recurring costs associated with operating and maintaining the required pollution control equipment which the violator avoided during the period of violation, followed by the year in which the dollars are expressed. Enter a zero if there are no (additional) annual costs associated with operating the new or improved pollution control equipment. If no dollar-year is entered, BEN assumes that the costs are in compliance-year dollars. The same format and eight character limitation apply to the annual expenditure as to the other cost inputs.

³⁷ Land is an asset and, therefore, cannot be deducted as an expense from taxable income.

The annual, recurring expense is an estimate of the average annual incremental cost of operating and/or maintaining the required environmental control measures. These expenditures should include any changes (both decreases and increases) in the cost of labor, power, water, raw materials and supplies, recurring training of employees, and any change in annual property taxes associated with operating the new or improved pollution control equipment.³⁸ In other words, the annual expense is the net change in the violator's annual expenditures from noncompliance to compliance.

The value of operating and maintenance (O&M) credits (or cost savings) should also be considered in estimating the incremental annual costs. O&M credits may represent actual O&M cost savings: heat recovery, product or byproduct recovery, and so forth.³⁹ For example, the installation of new pollution control equipment may reduce certain costs (such as sludge disposal) that were associated with operations during the period of noncompliance. If the resulting incremental O&M cost is negative (i.e., there is a net cost savings from the new pollution control equipment), the negative figures may be used in Variable 4. Credit is only given for annual, recurring expenses that were both paid and legal (e.g., no credit is given for costs associated with illegal disposal of hazardous waste).

Credit should only be included to the extent the cost savings was directly related to the installation and operation of the compliance system needed to remedy the violation. The annual costs should also reflect any annual lease payments for pollution control equipment. However, the annual costs should not include annualized capital recovery, interest payments, or depreciation. The economic benefit figure increases with greater avoided annual, recurring costs (See Exhibit 4-1).

5. Noncompliance Date

³⁸ In the case of underground injection wells, the cost of alternative disposal of injection fluids is the avoided operation cost. Similarly, the required treatment, storage or disposal of PCBs or other toxic wastes is an avoided operation cost. The avoided costs must be equal for each year of the violation in order to enter them into BEN as an annual continuing expense. If the avoided costs are different for each year of violation, you have two choices. You can run a separate BEN analysis for each year the costs were avoided, or you can treat them as avoided one-time nondepreciable costs according to the methodology set out in Appendix B. In this situation, you should also perform separate calculations for each year that the costs were avoided.

³⁹ To be included, such savings must be proven by the violator, not just asserted.

5. MONTH AND YEAR WHEN NONCOMPLIANCE BEGAN (e.g., 1,1994)

2,1994

The noncompliance date is the date when the first violation of the environmental requirement occurred.⁴⁰ Type in the month and the year, separated by a comma. The month is a number between 1 and 12, and cannot be omitted. The year must contain four digits (e.g., do not shorten the input to read **94** instead of **1994**). If you fail to enter four digits for the year the following error message occurs:

YEAR MUST BE 4 DIGITS.

There is one more limitation on all year entries: BEN will not accept years before 1971 or after 2050. The error message generated if the noncompliance year entered is earlier than 1971 is as follows:⁴¹

YEAR MUST BE 1971 OR LATER.

If you vary the date of noncompliance (holding all other variables constant), BEN automatically adjusts the cost of complying as of the new noncompliance date by discounting the costs to the revised date. The benefit from delayed and/or avoided expenditures generally increases with the length of the delay period. An earlier noncompliance date (holding the compliance date constant) will, in virtually all cases, increase the benefit

⁴⁰ The model uses this as the date by when the violator should have completed installation of the necessary pollution control equipment and had such equipment fully operational.

⁴¹ Although a statute of limitations may apply in your case, it should generally affect only the maximum penalty you can assess (i.e., the statutory cap). Since you are only trying to calculate the amount the violator gained by violating the law, you may go beyond any statute of limitations, as long as you do not exceed the statutory cap. Should your case go to trial or hearing, you should consult your legal staff before going forward with a benefit amount based on the earlier violations.

figure.⁴²

6. Compliance Date

6. MONTH AND YEAR WHEN COMPLIANCE ACHIEVED (e.g., 1,1996)
8,1997

Enter the date when the violator came into compliance with environmental requirements or the date you expect the violator to achieve compliance. Note that the date when the equipment was installed is not sufficient; the violator needs to be in compliance. The format and range limitations which apply to the noncompliance date also apply to the compliance date. In nearly all instances, the compliance date will occur after the noncompliance date. Therefore, if the user inputs a compliance date which is earlier than the noncompliance date, BEN prints a warning message. The warning message below is printed after you have finished inputting all values, but prior to asking you whether you would like to see a listing of current values. If you have accidentally switched the two dates, you are given the opportunity to correct the dates once entering **Y** to see a list of current values. Otherwise, the dates will be left as they have been entered.

⁴² In cases where the delay period straddles January 1, 1987, lengthening the period of non-compliance will decrease and possibly eliminate the benefit. This phenomenon is due to the reduction in marginal tax rates in 1987. These reductions decrease the value of the firm's tax deductions. Because the violator is complying late, it must deduct its pollution control expenditures at the lower tax rate. Thus it may cost more to comply late than to comply on time. Although tax rates changed again as of January 1993, the marginal rate increased at this time. Consequently, economic benefit figures for violations spanning January 1993 are greater than they would have been had the tax rates remained the same.

WARNING: YOUR COMPLIANCE DATE IS EARLIER OR THE SAME AS THE NONCOMPLIANCE DATE. WHILE THIS MAY BE APPROPRIATE IN CERTAIN CIRCUMSTANCES (E.G., CALCULATING SUPERFUND CASHOUTS), IT IS INAPPROPRIATE FOR MOST TYPICAL BEN APPLICATIONS. PLEASE CHECK YOUR NONCOMPLIANCE AND COMPLIANCE DATES.

Remember that BEN assumes that dollar amounts for Variables 2, 3 and 4 are in compliance-year dollars if you do not enter the dollar-year along with the amount. If you have not entered a specific dollar-year and you vary the compliance date, BEN will automatically change the dollar-year for the cost inputs. In general, it is best to include the dollar-year with your cost inputs.

7. Penalty Payment Date

7. MONTH AND YEAR WHEN PENALTY PAID (e.g., 6,1997)

4,1998

Enter the date the violator is expected to pay the civil penalty. Keep in mind that a considerable time lag often occurs between when the violator signs the consent decree and when it actually pays the penalty.⁴³ As with the previous dates, the month should be entered with the year, separated by a comma. The year must contain four digits. The penalty payment date may be before, after, or the same as the expected compliance date.

BEN states the economic benefit figure as of the penalty payment date and assumes that the violator earns a return on the benefit until that date. Therefore, the benefit figure increases for later penalty payment dates, holding all other variables constant (see Exhibit 4-1).

⁴³ If the violator is willing to transfer the entire penalty figure to an interest bearing escrow account on a date before entry of the consent decree, this escrow date may be used as the penalty payment date. Upon entry of the consent decree, the escrowed penalty plus any interest is paid to the U.S. Treasury.

**B. REQUIRED VARIABLES
(GOVERNMENT ENTITIES AND NOT-FOR-PROFIT ORGANIZATIONS)**

BEN can be used to estimate the economic benefit of delayed compliance for many types of not-for-profit organizations. With two exceptions you should treat Variables 1 through 7 in the same fashion as for for-profit organizations. The two required variables where characteristics differ between for-profit and not-for-profit entities are the "profit status" input and the cost inputs (if the entity received (or could have received) a grant for pollution abatement expenditures). Each item is discussed below.

1. Profit-Status Variable

Variable 1C requests the profit status of the organization under analysis. If you are making an economic benefit calculation for a not-for-profit organization, answer **2** as illustrated below. This response affects BEN's "standard variables" as discussed later in this chapter.

1B. PLEASE ENTER THE PROFIT STATUS OF THIS ENTITY:

- 1 FOR-PROFIT (e.g., A BUSINESS)
- 2 NOT-FOR-PROFIT (e.g., A MUNICIPALITY)

PROFIT STATUS:

2

2. Cost Variables

In certain cases, not-for-profit organizations may qualify for state or federal grants that cover a portion of pollution abatement expenditures. In these instances, the cost variables (Variables 2 through 4) requested by BEN may need to be adjusted to account for these grants. Such grants usually will support only an initial expenditure (e.g., one-time federal grant). For a detailed discussion of the procedures for incorporating grants into a BEN analysis, see Appendix B.

C. VARIABLES WITH STANDARD VALUES (FOR-PROFIT ENTITIES)

BEN uses 13 inputs to calculate the economic benefit of delayed compliance. At this point in the program you have already entered seven of the inputs. For the remaining six inputs, you can use the default values (these "standard values" are programmed into the BEN model and are updated annually) or you can override the standard values and enter your own information. The BEN model uses different standard values for for-profit and not-for profit entities. This section defines the for-profit standard values. (Section D of this chapter defines the "not-for-profit" standard values.)

The first time you run the program, the BEN model displays a short message outlining the choices available:

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BEN will use this information to estimate the economic
benefit.  If you select standard values for the remaining
six variables, these standard values will be printed in
your output.  You also have the option of entering your
own values for the remaining variables after Item 7.
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HOW DO YOU WISH TO TREAT REMAINING VARIABLES?
(1 = USE STANDARD VALUES, 2 = ENTER OWN VALUES)
```

1

If you select the first choice, BEN will use the standard values that it has stored in its memory. You need only type **1** followed by a carriage return (or **enter** key), and BEN will calculate the economic benefit using these stored standard values.

The standard values in BEN are updated annually to reflect changes in interest rates, tax law, and so

forth. While these values are updated, the assumptions upon which they are based remain the same.⁴⁴ If the case you are analyzing is significantly different from that represented by the standard values, you might wish to specify values for some of the optional inputs. In particularly complicated cases, you might also want to consult a financial analyst or an economist.

If you want to enter your own values for Variable 8 through 13, type **2** followed by a carriage return (or **enter** key). BEN then prompts you, beginning with Variable 8, for each nonstandard variable value.⁴⁵

The variables for which there are standard values are numbered from 8 to 13. (Recall that Variables 1 through 7 are the case name and the six inputs discussed in the previous sections.) Exhibit 4-3 lists the assumptions that support the standard values for for-profit entities.

⁴⁴ The one exception here regards the change in the standard value for BEN's discount rate (Variable 13). A previous version of BEN assumed that the pollution control investment would be financed by equity capital. The current version of BEN assumes that the investment would be financed at the weighted average cost of capital, including both debt and equity financing.

⁴⁵ If you select standard values on your first BEN calculation of a session and decide to manually input Variables 8 through 13 for your second calculation, you will be prompted for each variable individually on the second run. To save time, you may simply hit the carriage return (or **Enter** key) for each variable you want to keep standard during the second run.

Exhibit 4-3

**STANDARD VALUE CHARACTERISTICS
FOR-PROFIT VIOLATORS**

Variable		Characteristic Assumed for Standard Value
8.	Useful Life of Pollution Control Equipment	The violator is installing typical pollution control equipment, for example: air pollution control equipment, including an electrostatic precipitator, FGD scrubber, fabric filter, solvent recovery system, and incinerator; or water pollution treatment systems including activated sludge, screening, filtration, chemical treatment, and aerated lagoons.
9.	Marginal Tax Rate 1986 and Before	The for-profit violator's highest dollar of income is taxed on the margin at the highest corporate income tax rate (federal and state) for C-corporations, and at the highest individual income tax rate for other for-profit entities. The model assumes that the violator is located in a state whose highest marginal corporate or individual income tax rate is equal to the average across all states. BEN uses three tax rates for each type of for-profit entity, one for 1986 and before, one for 1987 to 1992, and one for 1993 and beyond, to take into account the changes in the federal marginal income tax rates made by Congress in 1986 and 1993.
10.	Marginal Tax Rate 1987 to 1992	
11.	Marginal Tax Rate 1993 and Beyond	
12.	Inflation Rate	The rate of increase in the violator's cost of compliance is equal to the average annual rate of increase in the <u>Chemical Engineering Plant Cost Index</u> over the most recent ten-year period.
13.	Discount Rate	The discount rate is based on the cost of capital for pollution control investments. The model assumes that pollution control investment is of average risk, and financed by a combination of debt and equity capital. The standard value is equal to the average corporate long term weighted-average cost of capital over the past ten years. The model further assumes that the entity earned a return on these delayed and avoided costs at this same rate.

1. Useful Life of Pollution Control Equipment

8. USEFUL LIFE OF POLLUTION CONTROL EQUIPMENT IN YEARS (e.g., 15) =
15

Enter the useful life in years followed by a carriage return (or **enter** key). The useful life is the number of years that the equipment can be operated before it must be replaced. The program only accepts integer values, and will not accept a zero. A fractional value, such as 15.6 years, must be rounded to the nearest integer value (i.e., 16). If compliance does not involve investment in capital equipment, use the standard value.⁴⁶ The standard value is 15 years, which is the assumed average life of a water or air pollution control system. Do not enter a useful life greater than 50 years or BEN will print the following error message and then repeat the data prompt:

ERROR: USEFUL LIFE CANNOT EXCEED 50 YEARS. ENTER AGAIN.

BEN uses the useful life figure to calculate the total cost of investing in and maintaining pollution control equipment over future replacement cycles.⁴⁷ Equipment with a long useful life is replaced less frequently than equipment with a short useful life. Assuming the same investment cost per replacement cycle of each, the total present value of the costs of continual replacement for the longer-lived equipment would be lower (since you would have to buy fewer of them, with each subsequent investment occurring later). Therefore, a longer useful life reduces the benefit of delaying compliance, holding all other inputs constant (see Exhibit 4-1).

⁴⁶ The useful life value does not affect the economic benefit result if your calculation does not involve a recurring capital expenditure. This choice does, however, define the number of years of data presented in Output Option 3.

⁴⁷ A violator who delays installing pollution control equipment for five years benefits not only by delaying the initial expenditure five years but also by postponing the second and all subsequent replacement cycles five years.

2. **Marginal Income Tax Rate for 1986 and Before**

9. MARGINAL INCOME TAX RATE FOR 1986 AND BEFORE (e.g., 49.6) =
49.6

3. **Marginal Income Tax Rate for 1987 to 1992**

10. MARGINAL INCOME TAX RATE FOR 1987 TO 1992 (e.g.,
38.6) =
38.6

4. **Marginal Income Tax Rate for 1993 and Beyond**

11. MARGINAL INCOME TAX RATE FOR 1993 AND BEYOND (e.g.,
39.4) =
39.4

Enter the marginal income tax rates in percentage terms followed by a carriage return (or **enter** key). The program will accept any positive value less than 90 percent. The standard values reflect the marginal federal tax rate on the highest dollar of income and the average of the marginal state tax rates on the highest dollar of income. BEN has three tax-rate inputs for both C-corporations and other for-profit entities because of the major changes to the federal tax code made by Congress in 1986 and 1993. The set of tax rates selected by the model depends on your answer to Variable 1C, the tax filing status of the violator. The appropriate standard values for C-corporations are displayed in the above boxes. The appropriate standard values for for-profit entities other than C-corporations are 50.0, 31.0, and 39.6. State-specific rates for both C-corporations and other for-profit entities are displayed in Exhibits 4-4 and 4-5.

The marginal income tax rate is the fraction of the last dollar of taxable income that a violator should pay to federal, state, and local governments. It is the statutory tax rate and it reflects the amount by which taxes would increase or decrease if taxable income were to increase or decrease. It is important to use the marginal tax rate, not the average tax rate (i.e., total tax divided by total taxable income), because the marginal tax rate is the rate which applies to incremental changes in the violator's tax-deductible expenses.

When there is a state or local income tax, the state and local tax rates must be adjusted to reflect the fact that state and local income taxes are deductible expenses in computing federal taxes. The standard values for these variables (a nationwide average of state marginal income tax rates) will produce a reasonable result. However, the preferable approach is to use state-specific values in place of the standard values in your BEN runs. The total corporate marginal tax rates, used for calculations involving C-corporations, are calculated for you by state in Exhibit 4-4 and the individual marginal tax rates, used for other for-profit entities, are shown in Exhibit 4-5.⁴⁸ The figures in these exhibits represent the federal marginal tax rate on the highest dollar of income and the marginal state rates on the highest dollar of income. Select the values for the state where the affected facility is located or incorporated.

⁴⁸ The adjustment is made by multiplying the state rates by a factor equal to one minus the marginal federal tax rate, as shown in the following formula:

$$\begin{aligned} \text{MTR}_{\text{TOTAL}} &= \text{MTR}_{\text{FEDERAL}} + [\text{MTR}_{\text{STATE}} \times (1 - \text{MTR}_{\text{FEDERAL}})] \\ \text{where: } \text{MTR}_{\text{FEDERAL}} &= \text{the marginal tax rate on the last dollar earned at the federal level; and} \\ \text{MTR}_{\text{STATE}} &= \text{the marginal tax rate at the state level} \end{aligned}$$

Therefore, if you were to calculate the total corporate marginal tax rate for 1993 and beyond, based on a marginal state tax rate of 10% for example, the result would be 41.5 percent:

$$\begin{aligned} \text{MTR}_{\text{TOTAL}} &= .35 + [.10 \times (1 - .35)] \\ &= .35 + (.10 \times .65) \\ &= .35 + .065 \\ &= .415 \\ &= 41.5\% \end{aligned}$$

Exhibit 4-4

**TOTAL CORPORATE MARGINAL TAX RATES BY STATE:
FOR USE IN CASES INVOLVING C-CORPORATIONS
(Percent)**

	1986 and Before ⁴⁹	1987 to 1992 ⁵⁰	1993 and Beyond ⁵¹
Alabama	48.7	37.3	38.3
Alaska	51.1	40.2	41.1
Arizona	51.7	40.1	40.9
Arkansas	49.2	38.3	39.2
California	51.2	40.1	41.0
Colorado	48.7	37.5	38.3
Connecticut	52.2	42.3	42.5
Delaware	50.7	39.7	40.7
Florida	49.0	37.6	38.6
Georgia	49.2	38.0	38.9
Hawaii	49.5	38.2	39.2
Idaho	50.2	39.3	40.2
Illinois	48.2	38.8	39.7
Indiana	47.6	39.2	40.1
Iowa	52.5	41.9	42.8
Kansas	49.6	37.0	37.6
Kentucky	49.9	39.4	40.4
Louisiana	50.3	39.3	40.2
Maine	50.8	40.5	40.8
Maryland	49.8	38.6	39.6
Massachusetts	51.1	40.3	41.2
Michigan	47.3	34.0	35.0

⁴⁹ Based on a federal marginal corporate income tax rate of 46% and state marginal corporate income tax rates for 1986 from the 1986-87 edition of The Book of The States.

⁵⁰ Based on a federal marginal corporate income tax rate of 34% and state marginal corporate income tax rates for 1992 provided by the Federation of Tax Administrators (FTA) in Washington, D.C.

⁵¹ Based on federal marginal corporate income tax rate of 35% and state marginal corporate income tax rates for 1995 provided by the Federation of Tax Administrators (FTA) in Washington, D.C.

Exhibit 4-4
(continued)

TOTAL CORPORATE MARGINAL TAX RATES BY STATE:
FOR USE IN CASES INVOLVING C-CORPORATIONS
(Percent)

	1986 and Before	1987 to 1992	1993 and Beyond
Minnesota	52.5	40.5	41.4
Mississippi	48.7	37.3	38.3
Missouri	48.7	38.3	39.1
Montana	49.6	38.5	39.4
Nebraska	49.6	39.2	40.1
Nevada	46.0	34.0	35.0
New Hampshire	50.5	39.3	39.6
New Jersey	50.9	39.9	40.9
New Mexico	49.9	39.0	39.9
New York	51.4	39.9	40.9
North Carolina	49.2	39.3	40.0
North Dakota	51.7	40.9	41.8
Ohio	51.0	39.9	40.8
Oklahoma	48.7	38.0	38.9
Oregon	50.1	38.4	39.4
Pennsylvania	51.1	42.1	42.1
Rhode Island	50.3	40.6	40.9
South Carolina	49.2	37.3	38.3
South Dakota	46.0	34.0	35.0
Tennessee	49.2	38.0	38.9
Texas	46.0	34.0	35.0
Utah	48.7	37.3	38.3
Vermont	50.9	39.4	40.4
Virginia	49.2	38.0	38.9
Washington	46.0	34.0	35.0
West Virginia	49.8	40.1	40.9
Wisconsin	50.3	39.2	40.1
Wyoming	46.0	34.0	35.0
Standard Value:	49.6	38.6	39.4

Exhibit 4-5

**TOTAL INDIVIDUAL MARGINAL TAX RATES BY STATE
FOR USE IN CASES INVOLVING FOR-PROFIT ENTITIES
OTHER THAN C-CORPORATIONS
(Percent)**

	1986 and Before⁵²	1987 to 1992⁵³	1993 and Beyond⁵⁴
Alabama	52.5	34.5	42.6
Alaska	50.0	31.0	39.6
Arizona	54.0	35.8	43.8
Arkansas	53.5	35.8	43.8
California	55.5	38.6	46.2
Colorado	54.0	34.5	42.6
Connecticut	52.3	34.1	42.3
Delaware	54.9	36.3	44.3
Florida	50.0	31.0	39.6
Georgia	53.0	35.1	43.2
Hawaii	55.5	37.9	45.6
Idaho	53.8	36.7	44.6
Illinois	51.3	33.1	41.4
Indiana	51.5	33.3	41.7
Iowa	56.5	37.9	45.6
Kansas	54.5	35.1	44.3
Kentucky	53.0	35.1	43.2
Louisiana	53.0	35.1	43.2
Maine	55.0	36.9	44.7
Maryland	52.5	34.5	42.6
Massachusetts	52.6	35.1	43.2
Michigan	52.6	34.2	42.3

⁵² Based on a federal marginal personal income tax rate of 50% and state marginal personal income tax rates for 1986 from the 1986-87 edition of The Book of The States.

⁵³ Based on a federal marginal personal income tax rate of 31% and state marginal personal income tax rates for 1992 provided by the Federation of Tax Administrators (FTA) in Washington, D.C.

⁵⁴ Based on a federal marginal personal income tax rate of 39.6% and state marginal personal income tax rates for 1995 provided by the Federation of Tax Administrators (FTA) in Washington, D.C.

Exhibit 4-5
(continued)

TOTAL INDIVIDUAL MARGINAL TAX RATES BY STATE
FOR USE IN CASES INVOLVING FOR-PROFIT ENTITIES
OTHER THAN C-CORPORATIONS
(Percent)

	1986 and Before	1987 to 1992	1993 and Beyond
Minnesota	55.0	36.9	44.7
Mississippi	52.5	34.5	42.6
Missouri	53.0	35.1	43.2
Montana	55.5	38.6	46.2
Nebraska	54.8	35.8	43.8
Nevada	50.0	31.0	39.6
New Hampshire	50.0	31.0	39.6
New Jersey	51.8	35.8	43.6
New Mexico	54.3	36.9	44.7
New York	56.8	36.4	44.4
North Carolina	53.5	36.3	44.3
North Dakota	54.5	39.3	46.8
Ohio	54.3	35.8	44.1
Oklahoma	53.0	35.8	43.8
Oregon	55.0	37.2	45.0
Pennsylvania	51.1	33.1	41.3
Rhode Island	55.6	38.5	46.2
South Carolina	53.5	35.8	43.8
South Dakota	50.0	31.0	39.6
Tennessee	50.0	31.0	39.6
Texas	50.0	31.0	39.6
Utah	53.9	36.0	43.9
Vermont	56.5	40.3	45.6
Virginia	52.9	35.0	43.1
Washington	50.0	31.0	39.6
West Virginia	56.5	35.5	43.5
Wisconsin	54.0	35.8	43.8
Wyoming	50.0	31.0	39.6
Standard Value:	53.2	35.1	43.1

State and local income taxes do not include sales tax, inventory tax, charter tax, or taxes on property. One-time tax payments, such as taxes on the purchase of equipment, should be included in the investment cost. If the tax recurs regularly, then it should be included in the annual expenditures. For example, as mentioned above, sales tax is included in the investment outlay while property tax is included in annual expenses.

BEN uses the marginal tax rate to account for the tax effects of compliance expenditures. Because tax-deductible expenses and depreciation associated with capital investments reduce taxable income, they result in tax savings. A lower marginal tax rate reduces this tax savings, thereby increasing the cost of compliance. Thus, a lower tax rate results in a higher benefit from delay (see Exhibit 4-1).⁵⁵

5. Inflation Rate

11. ANNUAL INFLATION RATE (e.g., 1.8) =
1.8

Enter the inflation rate as a percent, followed by a carriage return (or **enter** key). Be certain that you enter an annual rate and not a monthly or semiannual rate.

The inflation rate variable in BEN is the annual rate at which the costs of environmental control measures have grown and are expected to grow over time. These cost increases are the result of various factors affecting supply and demand for particular products and services, as well as general inflationary pressures in the economy.

⁵⁵ As mentioned above, the tax rate changes may cause a lower than expected BEN value, especially if the noncompliance and compliance dates straddle the 1986 tax code changes. BEN values may be lower than expected because lower tax rates reduce the tax savings (and increase the cost) associated with delayed compliance.

BEN uses the inflation rate to adjust the cost of compliance into noncompliance year-dollars and then into future-year costs. When the inflation rate is higher, the costs increase more quickly over time. An increase in the future cost of pollution controls reduces the economic benefit of delaying compliance, because the equipment would have cost less had it been purchased on time. Thus, in general, the economic benefit figure decreases for higher inflation rates (see Exhibit 4-1). There are rare exceptions to this relationship, depending on the year in which annual costs are expressed and the relative size of annual expenditures to capital and one-time expenditures.

The standard value of the inflation rate in BEN is an average of inflationary trends over the last ten years, as reported by the "Plant Cost Index" (PCI) published in Chemical Engineering magazine.⁵⁶ The Chemical Engineering Plant Cost Index is used rather than another index (e.g., the Consumer Price Index or the GNP Deflator), because it more accurately reflects the costs of activities associated with pollution-control expenditures. The PCI is based on cost changes in typical components of pollution control, including equipment, construction labor, buildings, and engineering and supervision. Exhibit 4-6 presents the annual Plant Cost Index for 1986 through 1996. Over the ten-year period between 1986 and 1996, inflation related to plant costs averaged 1.8 percent.⁵⁷ This value is reasonable for most BEN calculations. If you have some reason to believe that a better inflation forecast for your purposes is available, contact EPA Headquarters or an economist to discuss the use

⁵⁶ Chemical Engineering, McGraw Hill, Inc., biweekly issues. The Plant Cost Index is normally located on the page labeled "Economic Indicators."

⁵⁷ In general, an annual inflation rate is calculated as follows:

$$\left[\left[\frac{\text{Index in final year}}{\text{Index in initial year}} \right]^{1/N} - 1 \right] \times 100$$

Where: N = Final year - Initial year

To obtain the standard value, the index values for 1996 and 1986 (381.7 and 318.4, respectively) were used to calculate the ten-year average. The calculation is:

$$\left[\left[\frac{381.7}{318.4} \right]^{1/10} - 1 \right] \times 100$$

of a nonstandard input.

Exhibit 4-6

**CHEMICAL ENGINEERING PLANT COST INDEX
1986-1996**

Year	Index
1986	318.4
1987	323.8
1988	342.5
1989	355.4
1990	357.6
1991	361.3
1992	358.2
1993	359.2
1994	368.1
1995	381.1
1996	381.7
Source: <u>Chemical Engineering</u> , McGraw Hill, Inc., biweekly issues, 1986-1996.	

6. Discount Rate

```
12. DISCOUNT RATE: WEIGHTED-AVERAGE COST OF CAPITAL (e.g., 10.6) =  
10.6
```

Enter the discount rate as a percent followed by a carriage return (or **enter** key). Be certain that the discount rate is greater than the inflation rate. Otherwise, after all entries have been made, BEN will identify the error and will reprompt you for both the inflation rate and the discount rate. In the example below, the user entered an inflation rate of 9 percent and a discount rate of 7.5 percent:

```
ERROR:      THE INFLATION RATE      9.00%  
            MUST BE LESS THAN THE DISCOUNT RATE      7.50%  
            ENTER BOTH RATES AGAIN:
```

To calculate the economic benefit of delay as of the noncompliance date for all for-profit entities, BEN uses the weighted-average cost of capital to discount the relevant cash flows. The weighted-average cost of capital represents the average cost, after taxes, of capital to the violator, assuming constant risk and constant capital structure. In the case of pollution control expenditures, BEN assumes that the investment is financed using both debt and equity, in a mix representing the entity's existing mix of debt and equity financing. BEN also assumes that the pollution control expenditure is neither safer nor riskier, from an investment perspective, than the average firm's typical investments. BEN also uses the weighted-average cost of capital rate to bring the initial economic benefit forward to the penalty payment date.

The standard value in BEN is based on the weighted-average cost of long-term debt and equity capital over the most recent ten years for a firm of average risk.⁵⁸ The calculation of the discount rate is shown in Exhibit 4-7. A higher discount rate increases the return from delaying compliance, thereby increasing the economic benefit (See Exhibit 4-1).

Violators may occasionally request an adjustment in the discount rate to more precisely reflect their financial condition. If you want to make any changes to the discount rate, it is strongly recommended that you consult EPA Headquarters and/or an economist or financial analyst. Should EPA headquarters or your financial analyst agree to employ a more specific discount rate, you must make the violator aware that a corporate-specific analysis could yield a higher discount rate than the standard value. Thus, the new economic benefit calculated in the analysis would be correspondingly higher.

⁵⁸ The weighted-average cost of capital (WACC) is calculated according to the following formula:

$$WACC = \left[[CBA * (1.0 - TR)] * W_D \right] + \left[[TB + R] * W_E \right]$$

where:

CBA	=	Ten-year average return on corporate bonds
TR	=	Marginal corporate tax rate
W _D	=	Fraction of total financing made up of debt
TB	=	Ten-year average return on treasury bonds
R	=	Equity risk premium
W _E	=	Fraction of total financing made up of equity

The calculation of the discount rate is shown in Exhibit 4-7.

Exhibit 4-7

WEIGHTED AVERAGE COST OF CAPITAL CALCULATIONS

YEAR	COST OF DEBT ¹	TAX RATE ²	AT DEBT COST	FRACTION OF DEBT ³	TEN YEAR T BOND ⁴	RISK PREMIUM ⁵	EQUITY COST ⁶	FRACTION OF EQUITY ³	WACC
1987	9.91	38.4%	6.10	0.43	8.39	7.5	15.89	0.57	11.70
1988	10.18	38.4%	6.27	0.52	8.85	7.5	16.35	0.48	11.15
1989	9.66	38.4%	5.95	0.49	8.49	7.5	15.99	0.51	11.07
1990	9.77	38.5%	6.01	0.50	8.55	7.5	16.05	0.50	11.03
1991	9.23	38.5%	5.68	0.49	7.86	7.5	15.36	0.51	10.63
1992	8.55	38.6%	5.25	0.47	7.01	7.5	14.51	0.53	10.15
1993	7.54	39.4%	4.57	0.47	5.87	7.5	13.37	0.53	9.23
1994	8.26	39.4%	5.01	0.44	7.09	7.5	14.59	0.56	10.33
1995	7.83	39.4%	4.74	0.42	6.57	7.5	14.07	0.58	10.15
1996	7.66	39.4%	4.64	0.42	6.44	7.5	13.94	0.58	10.03
10 YEAR AVERAGE	8.86		5.42		7.51		15.01		10.55

¹ This is the average interest rate paid on corporate bonds. Table 1.35, Federal Reserve Bulletin.

² For further explanation of how the average total corporate marginal tax rate is calculated, see the BEN User's Manual.

³ These weights represent the fraction of financing that is made up of debt or equity. The weights are constructed using data from Standard and Poor's Stock Analyst's Handbook. The equity indexes are adjusted to reflect their market value.

⁴ Treasury bond data from Table 1.35, Federal Reserve Bulletin.

⁵ This is the arithmetic mean of the long-term equity risk premium for 1926 through the most recent year available calculated by Ibbotson Associates.

⁶ For further explanation of the calculation of equity cost of capital, see the BEN User's Manual.

**D. VARIABLES WITH STANDARD VALUES
(GOVERNMENT ENTITIES AND NOT-FOR-PROFIT ORGANIZATIONS)**

If the violator is a not-for-profit entity, BEN will use different standard values for Variables 9, 10, 11, and 13 described in section C of this chapter. Exhibit 4-8 lists the assumptions that support the standard values for not-for-profit organizations.

Exhibit 4-8

**STANDARD VALUE CHARACTERISTICS
NOT-FOR-PROFIT VIOLATORS**

Variable	Characteristic Assumed for Standard Value
8. Useful Life of Pollution Control Equipment	The violator is installing typical pollution control equipment, such as air or water pollution control equipment. The standard value for useful life is 15 years.
9. Marginal Tax Rate 1986 and Before 10. Marginal Tax Rate 1987 to 1992 11. Marginal Tax Rate 1993 and Beyond	The not-for-profit violator does not pay taxes; therefore its marginal tax rate is 0 percent.
12. Inflation Rate	The rate of increase in the violator's cost of compliance is equal to the average annual rate of increase in the <u>Chemical Engineering</u> Plant Cost Index over the most recent ten year period.
13. Discount Rate	The discount rate is equal to the average annual cost of debt to municipalities over the last ten years.

The two areas where not-for-profit standard values differ from for-profit standard values (the tax variables and the discount rate) are discussed in more detail below.

1. Marginal Income Tax Rates for All Years

Not-for-profit entities have a tax-exempt status. When you indicate that the violator is a not-for-profit entity, BEN automatically sets the marginal income tax rates to zero for Variables 9 through 11. Thus, at a zero marginal tax rate, BEN need not calculate the tax consequences associated with depreciating or expensing pollution control abatement expenditures. Note that the model will only accept a tax rate of zero when running BEN for a not-for-profit entity.

2. Discount Rate

The economic benefit calculations in BEN for not-for-profit organizations use the cost of municipal debt as the basis for the discount rate. When you indicate that the violator is a not-for-profit entity, BEN automatically defines the discount rate for a not-for-profit entity based on the cost of average municipal bond yields as reported by Moody's over the last ten years.

If you want to modify this standard value, you should enter the cost of debt most applicable to the violator. This is particularly important when the violator is not a municipality. The municipal bond yield can be estimated by the interest rates for municipal bonds issued during the noncompliance period. Alternatively, you can use the reported yield on municipal debt having the quality rating assigned to the violator's bonds, or when the rating is not known, the reported average municipal bond yield.

Municipal bond yields are reported monthly in Moody's Municipal and Government Manual for specific municipalities and as averages for each bond quality rating. Bonds are rated by Moody's according to their riskiness, the higher quality ratings denoting lower risk bonds. The ratings range from "Aaa", the highest quality, to a low of "C". Average bond yields are reported for only the highest four ratings: "Aaa," Aa," A," and "Baa". The municipal bond yields over the past twenty-two years are shown in Exhibit 4-9.

The standard value for the cost of municipal debt is based on the average municipal bond yield across all four bond ratings from 1986 to 1995, and is equal to 6.7%.

Exhibit 4-9

**MUNICIPAL BOND YIELD AVERAGES
1974-1996**

	Average	Aaa	Aa	A	Baa
1974	6.19	5.89	6.04	6.27	6.53
1975	7.05	6.42	6.77	7.37	7.62
1976	6.61	5.65	6.12	7.17	7.49
1977	5.64	5.20	5.39	5.86	6.12
1978	5.86	5.51	5.68	5.99	6.27
1979	6.28	5.89	6.11	6.34	6.76
1980	8.34	7.85	8.06	8.44	9.01
1981	11.10	10.42	10.89	11.31	11.75
1982	11.63	10.88	11.30	11.84	12.48
1983	9.45	8.80	9.20	9.64	10.17
1984	10.00	9.61	9.88	10.15	10.37
1985	9.08	8.60	8.93	9.20	9.59
1986	7.33	6.95	7.16	7.42	7.75
1987	7.59	7.12	7.39	7.76	8.20
1988	7.57	7.36	7.49	7.59	7.84
1989	7.18	7.00	7.10	7.22	7.40
1990	7.12	6.96	7.06	7.15	7.29
1991	6.78	6.56	6.69	6.84	6.99
1992	6.27	6.07	6.20	6.34	6.46
1993	5.59	5.38	5.50	5.65	6.08
1994	5.96	5.77	5.93	6.02	6.09
1995	5.89	5.77	5.80	5.91	6.09
1996	5.67	5.56	5.61	5.72	5.83
Source: <u>Moody's Municipal and Government Manual</u>					

This chapter describes the output provided by BEN and the procedures used to revise data inputs. The chapter is divided into two sections. Section A describes the three levels of detail available for output. Output examples for each option are provided and explained. Section B explains how to re-run the program, changing some or all of the variables. The different procedures for calculations using standard values and calculations using user-specified values are described. Also shown are error messages specific to changing standard and user-specified values.

A. OUTPUT OPTIONS

1. Selecting Output

When BEN has finished its calculations, it asks how the output should be presented. The first time through the program, BEN describes the four output choices in detail:

BEN is ready to provide output. You have 4 choices:

1. Display only the economic benefit of delayed compliance. No intermediate calculations are printed. All of the inputs used in the calculations are shown.
2. Display the economic benefit of delayed compliance plus the present values of delayed and on time cash flows. All of the inputs used in the calculations are shown.
3. Display Option 2 plus 2 tables of annual cash flows for the useful life of the initial pollution control equipment. All of the inputs used in the calculations are shown.
4. Do not display results. Use this option if a data entry error is discovered.

CHOOSE OUTPUT OPTION 1, 2, 3, OR 4.

All output options are designed to fit on standard letter-size paper with top, bottom, and side margins on each page. For identification purposes, each page is marked with the date of the case run and the case name. All values are rounded to the nearest dollar for printing in the output tables.

When one or more of the expenditure inputs is a large dollar amount (i.e., any of the cost inputs exceed \$500,000), BEN converts all dollar amounts to thousands. When this conversion occurs, BEN provides a message alerting you that the results are in thousands of dollars. The message appears in parentheses under the economic benefit result in output Options 1, 2, and 3 and also under the table headings in Option 3.

In all of the output options, the variables used in the calculation are printed below the results. The costs in this listing are the original cost inputs; that is, they are not converted to thousands even if conversion to thousands is made in the output.

Select one of the output options by typing the number **1**, **2**, or **3**; you can avoid printing output by choosing **4**. BEN will respond with the prompt below if you choose Option 1, 2, or 3:

POSITION PAPER ON BOTTOM LINE OF THIS PAGE,
THEN PRESS CARRIAGE RETURN

If you are using a PC without a printer, you can simply press the carriage return (or **enter** key) to display the output on the screen. After you have finished all of your desired economic benefit calculations, BEN will provide you the option to receive a printed copy of the output as described in Chapter 2.

2. Output Option 1

Option 1 is the shortest form of output. Option 1 reports the economic benefit of delayed compliance and the input values used in the calculation. The economic benefit is expressed as of the penalty payment date. Exhibit 5-1 shows the output under Option 1. Note that the number of months of delay between the initial date of noncompliance and the compliance date is printed in a label next to the economic benefit result. The label also states the number of months from the initial noncompliance date until the date the penalty is to be paid.

Exhibit 5-1

OUTPUT OPTION 1

ENTITY X EXAMPLE

BEN VERSION 4.4 JULY 1, 1997

THE ECONOMIC BENEFIT OF A 42 MONTH DELAY
DATE, 50 MONTHS AFTER NONCOMPLIANCE \$ 419879
=====

-->-->-->--> THE ECONOMIC BENEFIT CALCULATION ABOVE <--<--<--<--
USED THE FOLLOWING VARIABLES:

USER SPECIFIED VALUES

1A. CASE NAME = ENTITY X EXAMPLE
1B. PROFIT STATUS = FOR-PROFIT
1C. FILING STATUS = C-CORPORATION
2. INITIAL CAPITAL INVESTMENT (RECURRING)= \$ 405000 1997 DOLLARS
3. ONE-TIME NONDEPRECIABLE EXPENDITURE = \$ 210000 1997 DOLLARS
(TAX-DEDUCTIBLE EXPENSE)
4. ANNUAL EXPENSE = \$ 85750 1997 DOLLARS
5. FIRST MONTH OF NONCOMPLIANCE = 2, 1994
6. COMPLIANCE DATE = 8, 1997
7. PENALTY PAYMENT DATE = 4, 1998

STANDARD VALUES

8. USEFUL LIFE OF POLLUTION CONTROL EQUIPMENT = 15 YEARS
9. MARGINAL INCOME TAX RATE FOR 1986 AND BEFORE = 49.6 %
10. MARGINAL INCOME TAX RATE FOR 1987 TO 1992 = 38.6 %
11. MARGINAL INCOME TAX RATE FOR 1993 AND BEYOND = 39.4 %
12. ANNUAL INFLATION RATE = 1.8 %
13. DISCOUNT RATE: WEIGHTED-AVERAGE COST OF CAPITAL 10.6 %

3. Output Option 2

Option 2 presents the final economic benefit calculation as in Option 1, but also adds intermediate steps in the development of this calculation. Option 2 provides more information and can help users understand the effect of changes in the inputs on the economic benefit. Exhibit 5-2 shows an example of output Option 2.

Exhibit 5-2

OUTPUT OPTION 2

ENTITY X EXAMPLE

BEN VERSION 4.4 JULY 1, 1997

A.	VALUE OF EMPLOYING POLLUTION CONTROL ON-TIME AND OPERATING IT FOR ONE USEFUL LIFE IN 1994 DOLLARS	\$	814440
B.	VALUE OF EMPLOYING POLLUTION CONTROL ON-TIME AND OPERATING IT FOR ONE USEFUL LIFE PLUS ALL FUTURE REPLACEMENT CYCLES IN 1994 DOLLARS	\$	1095535
C.	VALUE OF DELAYING EMPLOYMENT OF POLLUTION CONTROL EQUIPMENT BY 42 MONTHS PLUS ALL FUTURE REPLACEMENT CYCLES IN 1994 DOLLARS	\$	819597
D.	ECONOMIC BENEFIT OF A 42 MONTH DELAY IN 1994 DOLLARS (EQUALS B MINUS C)	\$	275938
E.	THE ECONOMIC BENEFIT AS OF THE PENALTY PAYMENT DATE, 50 MONTHS AFTER NONCOMPLIANCE	\$	419879 =====

-->-->-->--> THE ECONOMIC BENEFIT CALCULATION ABOVE <--<--<--<--<
USED THE FOLLOWING VARIABLES:

USER SPECIFIED VALUES

1A.	CASE NAME = ENTITY X EXAMPLE	
1B.	PROFIT STATUS =	FOR-PROFIT
1C.	FILING STATUS =	C-CORPORATION
2.	INITIAL CAPITAL INVESTMENT (RECURRING) = \$	405000 1997 DOLLARS
3.	ONE-TIME NONDEPRECIABLE EXPENDITURE = \$ (TAX-DEDUCTIBLE EXPENSE)	210000 1997 DOLLARS
4.	ANNUAL EXPENSE = \$	85750 1997 DOLLARS
5.	FIRST MONTH OF NONCOMPLIANCE =	2, 1994
6.	COMPLIANCE DATE =	8, 1997
7.	PENALTY PAYMENT DATE =	4, 1998

STANDARD VALUES

8.	USEFUL LIFE OF POLLUTION CONTROL EQUIPMENT =	15 YEARS
9.	MARGINAL INCOME TAX RATE FOR 1986 AND BEFORE =	49.6 %
10.	MARGINAL INCOME TAX RATE FOR 1987 TO 1992 =	38.6 %
11.	MARGINAL INCOME TAX RATE FOR 1993 AND BEYOND =	39.4 %
12.	ANNUAL INFLATION RATE =	1.8 %
13.	DISCOUNT RATE: WEIGHTED-AVERAGE COST OF CAPITAL	10.6 %

As illustrated in Exhibit 5-2, the top half of output Option 2 presents intermediate steps of the BEN calculation in addition to total economic benefit as of the penalty payment date:

- o **Calculation A** is the present value of the costs that would have been associated with the timely purchase, installation, and operation of pollution control equipment over one

useful life. This figure is expressed in noncompliance-year dollars.

- o **Calculation B** includes the present value of the costs associated with subsequent replacement and operation of equipment, in addition to the total of the one-time expenditure and the first useful life period costs expressed in A. This figure is the present value cost that the violator would have paid had it complied on time, expressed in noncompliance year dollars.
- o **Calculation C** expresses the present value costs of delayed compliance as of the noncompliance date including all subsequent replacements of equipment, if any. This value is usually less than B, and represents the actual cost to the violator of delayed compliance with environmental requirements.
- o **Calculation D**, the initial economic benefit, is obtained by subtracting C from B. The initial economic benefit in D is expressed in dollars as of the noncompliance date. In some cases D may not exactly equal B minus C because of rounding.
- o **Calculation E** adjusts D to the value of the economic benefit as of the expected penalty payment date. This adjustment reflects the violator's earnings on the initial economic benefit between the noncompliance date and the penalty payment date.

4. **Output Option 3**

Option 3 shows the detailed calculations behind the final BEN values and is most helpful to financial analysts wanting to understand the program's calculations. Option 3 provides two tables showing annual cash flows over the first useful life of the pollution control equipment. The first table contains the cash flows that would have occurred had the violator complied on time. The second table contains the cash flows estimated to occur when the violator actually complies. The last page of output for Option 3 is identical to the one-page Option 2 output. Exhibit 5-3 presents an example of output Option 3.

In the two tables of annual cash flows in Option 3, the header displays the initial capital investment plus any non-deductible one-time expenditures. For the on-time case, this value is expressed in noncompliance-year

dollars and for the delay case, this value is inflated to compliance-year dollars. Note that this figure in either table might differ from the sum of the initial capital investment and non-deductible one-time expenditure printed in the variable value listing at the end of the second page. This difference occurs because you might have entered the costs in dollars of another year (or by default, in compliance-year dollars) and the figures in the table are adjusted for inflation to the noncompliance or compliance year.

The first column in each cash flow table lists the years of the cash flow analysis beginning with year zero: when compliance should have been achieved for the on-time case table and when compliance was achieved for the delay case table. The years printed after the zero correspond to the number of years in the useful life of the pollution control equipment. In Exhibit 5-3 there is a fifteen-year useful life.

The remaining columns in the cash flow tables contain the types of cash flows and factors used to arrive at a present value. The top half of the table displays capital and one-time non-deductible costs. The bottom half contains annual expenses, one-time deductible expenses, and the total of the present values of capital investment, depreciation tax benefit, and after-tax O&M expenditures. The last column in the bottom half of the table sums all present value calculations for each year. All cash outflows are listed as negative values, and the tax savings as positive values (because they represent a benefit to the firm).

The second column, "Investment Net of ITC," is the capital cost plus any one-time non-deductible expenditures, less any investment tax credits. This net expenditure is assumed to occur in year zero and is stated in noncompliance-year dollars. This cost figure is lower than the investment figure listed in the table header by the amount of the investment tax credit (ITC) taken by the violator. For for-profit entities, BEN uses a ten-percent ITC for investments made before 1986 and a zero-percent ITC for investments made in 1986 and later.⁵⁹ For not-for-profit organizations, BEN uses a zero-percent ITC rate for all years.

The third column, "Depreciation," lists the depreciation expenses that the firm is allowed to deduct from taxable income, thereby reducing its taxes. BEN uses a five-year straight-line method of depreciation for

⁵⁹ BEN's treatment of the phase-out of the ITC applies to a typical firm's situation. In certain instances, the ITC was applicable for qualifying property following December 31, 1985. Qualifying property includes buildings or plants where over five percent of the cost of the project was incurred by the end of 1985. If you are evaluating a violator's situation where this is the case, consult with an economist or financial analyst for assistance in completing an "off-line" calculation.

investments made before 1987. For investments made in 1987 and later, the model uses the double-declining balance (with half-year convention) for years one to four and converts to a straight-line method in year five. This method is prescribed by the revised tax law's Modified Accelerated Cost Recovery System (MACRS) and uses a seven year depreciation life.

OUTPUT OPTION 3 (page 1)

ENTITY X EXAMPLE

BEN VERSION 4.4 JULY 1, 1997

ON-TIME CASE CASH FLOWS
 FIRST CYCLE CASH FLOWS BASED ON
 A TOTAL INITIAL OUTLAY OF \$ 383894
 AS OF THE BEGINNING OF THE PERIOD OF NONCOMPLIANCE

YEAR	INVESTMENT NET OF ITC (\$)	DEPRECIATION (\$)	DEPRECIATION TAX SAVINGS (\$)	DEPREC DISCOUNT FACTOR	PRESENT VALUE OF DEPREC TAX SAVINGS (\$)
0	-383894	0	0	1.0000	0
1	0	54843	21608	.9509	20547
2	0	94016	37042	.8597	31847
3	0	67155	26459	.7773	20568
4	0	47968	18899	.7028	13283
5	0	34261	13499	.6355	8578
6	0	34261	13499	.5746	7756
7	0	34261	13499	.5195	7013
8	0	17130	6749	.4697	3170
9	0	0	0	.4247	0
10	0	0	0	.3840	0
11	0	0	0	.3472	0
12	0	0	0	.3139	0
13	0	0	0	.2838	0
14	0	0	0	.2566	0
15	0	0	0	.2320	0

YEAR	ANNUAL EXPENSES	AFTER-TAX ANNUAL COST	PROJECT DISCOUNT FACTOR	PRESENT VALUE AFTER-TAX O&M (\$)	TOTAL PRESENT VALUE (\$)
0	-199056	-120628	1.0000	-120628	-504522
1	-82010	-49698	.9509	-47256	-26710
2	-83486	-50592	.8597	-43496	-11650
3	-84989	-51503	.7773	-40035	-19468
4	-86518	-52430	.7028	-36850	-23567
5	-88076	-53374	.6355	-33918	-25340
6	-89661	-54335	.5746	-31219	-23463
7	-91275	-55313	.5195	-28735	-21723
8	-92918	-56308	.4697	-26449	-23279
9	-94590	-57322	.4247	-24344	-24344
10	-96293	-58354	.3840	-22408	-22408
11	-98026	-59404	.3472	-20625	-20625
12	-99791	-60473	.3139	-18984	-18984
13	-101587	-61562	.2838	-17473	-17473
14	-103416	-62670	.2566	-16083	-16083
15	-105277	-63798	.2320	-14803	-14803

PRESENT VALUE OF PURCHASING THE INITIAL
 POLLUTION CONTROL EQUIPMENT ON-TIME AND
 OPERATING IT THROUGHOUT ONE USEFUL LIFE \$ -814440

Exhibit 5-3 (continued)

OUTPUT OPTION 3 (page 2)

ENTITY X EXAMPLE

BEN VERSION 4.4 JULY 1,1997

DELAY CASE CASH FLOWS
FIRST CYCLE CASH FLOWS BASED ON
A TOTAL INITIAL OUTLAY OF \$ 408629
AS OF THE END OF THE PERIOD OF NONCOMPLIANCE

YEAR	INVESTMENT NET OF ITC (\$)	DEPRECIATION (\$)	DEPRECIATION TAX SAVINGS (\$)	DEPREC DISCOUNT FACTOR	PRESENT VALUE OF DEPREC TAX SAVINGS (\$)
0	-408629	0	0	1.0000	0
1	0	58377	23000	.9509	21870
2	0	100073	39429	.8597	33899
3	0	71481	28164	.7773	21893
4	0	51058	20117	.7028	14139
5	0	36468	14369	.6355	9131
6	0	36468	14369	.5746	8256
7	0	36468	14369	.5195	7465
8	0	18234	7184	.4697	3375
9	0	0	0	.4247	0
10	0	0	0	.3840	0
11	0	0	0	.3472	0
12	0	0	0	.3139	0
13	0	0	0	.2838	0
14	0	0	0	.2566	0
15	0	0	0	.2320	0

YEAR	ANNUAL EXPENSES	AFTER-TAX ANNUAL COST	PROJECT DISCOUNT FACTOR	PRESENT VALUE AFTER-TAX O&M (\$)	TOTAL PRESENT VALUE (\$)
0	-211882	-128400	1.0000	-128400	-537029
1	-87293	-52900	.9509	-50301	-28431
2	-88865	-53852	.8597	-46299	-12400
3	-90464	-54821	.7773	-42615	-20722
4	-92093	-55808	.7028	-39224	-25085
5	-93750	-56813	.6355	-36103	-26972
6	-95438	-57835	.5746	-33231	-24975
7	-97156	-58876	.5195	-30587	-23122
8	-98905	-59936	.4697	-28153	-24778
9	-100685	-61015	.4247	-25913	-25913
10	-102497	-62113	.3840	-23851	-23851
11	-104342	-63231	.3472	-21953	-21953
12	-106220	-64369	.3139	-20207	-20207
13	-108132	-65528	.2838	-18599	-18599
14	-110079	-66708	.2566	-17119	-17119
15	-112060	-67908	.2320	-15757	-15757

PRESENT VALUE OF DELAYING THE PURCHASE
OF THE INITIAL POLLUTION CONTROL EQUIPMENT
AND OPERATING IT THROUGHOUT ITS USEFUL LIFE \$ -866915

OUTPUT OPTION 3 (page 3)

ENTITY X EXAMPLE

BEN Version 4.4 JULY 1, 1997

A.	VALUE OF EMPLOYING POLLUTION CONTROL ON-TIME AND OPERATING IT FOR ONE USEFUL LIFE IN 1994 DOLLARS \$	814440
B.	VALUE OF EMPLOYING POLLUTION CONTROL ON-TIME AND OPERATING IT FOR ONE USEFUL LIFE PLUS ALL FUTURE REPLACEMENT CYCLES IN 1994 DOLLARS \$	1095535
C.	VALUE OF DELAYING EMPLOYMENT OF POLLUTION CONTROL EQUIPMENT BY 42 MONTHS PLUS ALL FUTURE REPLACEMENT CYCLES IN 1994 DOLLARS \$	819597
D.	ECONOMIC BENEFIT OF A 42 MONTH DELAY IN 1994 DOLLARS (EQUALS B MINUS C) \$	275938
E.	THE ECONOMIC BENEFIT AS OF THE PENALTY PAYMENT DATE, 50 MONTHS AFTER NONCOMPLIANCE \$	419879 =====

-->-->-->--> THE ECONOMIC BENEFIT CALCULATION ABOVE <--<--<--<--<
USED THE FOLLOWING VARIABLES:

USER SPECIFIED VALUES

1A.	CASE NAME = ENTITY X EXAMPLE	
1B.	PROFIT STATUS =	FOR-PROFIT
1C.	FILING STATUS =	C-CORPORATION
2.	INITIAL CAPITAL INVESTMENT (RECURRING)= \$	405000 1997 DOLLARS
3.	ONE-TIME NONDEPRECIABLE EXPENDITURE = \$ (TAX-DEDUCTIBLE EXPENSE)	210000 1997 DOLLARS
4.	ANNUAL EXPENSE = \$	85750 1997 DOLLARS
5.	FIRST MONTH OF NONCOMPLIANCE =	2, 1994
6.	COMPLIANCE DATE =	8, 1997
7.	PENALTY PAYMENT DATE =	4, 1998

STANDARD VALUES

8.	USEFUL LIFE OF POLLUTION CONTROL EQUIPMENT =	15 YEARS
9.	MARGINAL INCOME TAX RATE FOR 1986 AND BEFORE =	49.6 %
10.	MARGINAL INCOME TAX RATE FOR 1987 TO 1992 =	38.6 %
11.	MARGINAL INCOME TAX RATE FOR 1993 AND BEYOND =	39.4 %
12.	ANNUAL INFLATION RATE =	1.8 %
13.	DISCOUNT RATE: WEIGHTED-AVERAGE COST OF CAPITAL	10.6 %

To calculate the depreciation tax benefit, the depreciation amount is multiplied by the marginal tax rate. These figures must be adjusted to reflect the time period in which they occur (e.g., the further in the future they occur, the lower their present value). The discount factor related to depreciation cash flows is listed in column 5. This discount factor is the same as the weighted-average cost of capital described in Chapter 4. Multiplying this discount factor by the depreciation tax benefit yields the present values listed in column 6.

The bottom half of the Option 3 cash flow table mainly details the annual expenditures. Annual costs begin in year 1 and are inflated yearly to reflect the rising prices of labor and materials. These costs appear in the second column. If you have entered a tax-deductible one-time expenditure, its value will appear in year 0 (zero) in this column. Annual costs are tax-deductible and must be adjusted to reflect this benefit. Multiplying the annual expenses by one minus the tax rate adjusts them to reflect the actual cash outflow from the firm, net of the tax benefit that arises from deducting the original annual expenditure. The present value of these annual costs net of the tax benefit is computed by multiplying the figures in column 3 by the weighted-average cost of capital discount rate described in Chapter 4. The last column in the bottom half of the table sums the present values of capital investment, depreciation tax benefit, and after-tax annual expenditures.

The total of the annual present values appears at the very bottom of the page, next to the label: "PRESENT VALUE OF PURCHASING THE INITIAL POLLUTION CONTROL EQUIPMENT ON-TIME AND OPERATING IT THROUGHOUT ONE USEFUL LIFE." This figure is the same as the value shown as Calculation A in Output Option 2 (see Exhibit 5-2).

Output Option 3 produces a similar table for the delay case. These calculations are in compliance-year dollars. The output sums the cost of compliance at the bottom of the page next to the label: "PRESENT VALUE OF DELAYING THE PURCHASE OF THE INITIAL POLLUTION CONTROL EQUIPMENT AND OPERATING IT THROUGHOUT ITS USEFUL LIFE." This value does not match Calculation C in Option 2 because the delay case table is in compliance-year dollars rather than noncompliance-year dollars, and because it only includes the cash flows from one useful life whereas Calculation C includes all additional replacement cycles.

5. Other Information

The first three output options described above for a user-specified calculation are the same for a standard

value calculation with one exception: in a standard value calculation, the variable listing displays user-specified inputs and standard values separately (see Exhibit 5-4).

Option 4 allows you to skip printing the output. This option should be used if you have discovered an error in your entry values. BEN will then ask if you wish to make any further changes so that you can correct the error. Type **0** (zero) after you have made all necessary changes. BEN then asks if you would like to see a listing of the current variable values to review your changes. If you answer **N**, for no, BEN again lists the four output options.

Exhibit 5-4

INPUT LISTING FOR CALCULATION USING STANDARD VALUES

```
-->-->-->-->--> THE ECONOMIC BENEFIT CALCULATION ABOVE <--<--<--<--<--
      USED THE FOLLOWING VARIABLES:
      USER SPECIFIED VALUES
      -----
1A. CASE NAME = ENTITY X EXAMPLE
1B. PROFIT STATUS =
1C. FILING STATUS =
2. INITIAL CAPITAL INVESTMENT (RECURRING)= $ 405000 1997 DOLLARS
3. ONE-TIME NONDEPRECIABLE EXPENDITURE = $ 210000 1997 DOLLARS
   (TAX-DEDUCTIBLE EXPENSE)
4. ANNUAL EXPENSE = $ 85750 1997 DOLLARS
5. FIRST MONTH OF NONCOMPLIANCE = 2, 1994
6. COMPLIANCE DATE = 8, 1997
7. PENALTY PAYMENT DATE = 4, 1998

      STANDARD VALUES
      -----
8. USEFUL LIFE OF POLLUTION CONTROL EQUIPMENT = 15 YEARS
9. MARGINAL INCOME TAX RATE FOR 1986 AND BEFORE = 49.6 %
10. MARGINAL INCOME TAX RATE FOR 1987 TO 1992 = 38.6 %
11. MARGINAL INCOME TAX RATE FOR 1993 AND BEYOND = 39.4 %
12. ANNUAL INFLATION RATE = 1.8 %
13. DISCOUNT RATE: WEIGHTED-AVERAGE COST OF CAPITAL 10.6 %
```

B. CHANGING INPUT VALUES

Once BEN has completed a calculation you can alter your inputs to perform another BEN run or you can end the session in order to receive a printout of your calculation. This section outlines the procedure for changing variable values after you complete your initial run. This feature allows you to recalculate the economic benefit without having to re-enter new information for all variables.

```
DO YOU WISH TO DO ANOTHER ECONOMIC SAVINGS CALCULATION?  
(0=NO; 1=YES, USING STANDARD VALUES; 2=YES; USING OWN INPUTS)
```

If you want to do another calculation, you must choose between a calculation using the standard values for variables 8 through 13 or a calculation in which you specify all inputs. Typing **1** indicates that you wish to use the standard values in the subsequent calculation; typing **2** indicates that all values will be user-specified. BEN then prompts you for the variable(s) you wish to change. The next two subsections outline procedures for changing variable values.

1. Changing Values in the Standard Value Mode

```
DO YOU WISH TO DO ANOTHER ECONOMIC SAVINGS CALCULATION?  
(0=NO; 1=YES, USING STANDARD VALUES; 2=YES, USING OWN INPUTS)
```

1

This section outlines the procedures for changing variable values when BEN assigns standard values to variables 8 through 13. Type **1** to indicate that you wish to use standard values.

BEN will only allow you to change variables 1 through 7, since standard values will be used for the remaining variables. You can, however, change any or all of variables 1 through 7 one or more times during the change procedure. In the following example, the user wants to change variable 4.

TYPE NUMBER OF VARIABLE BETWEEN 1 AND 7 TO BE CHANGED
(TYPE 0 FOR NO CHANGE)

4

BEN responds with a prompt for the new variable value:

4. ANNUAL EXPENSE =
(FOLLOW WITH DOLLAR-YEAR SEPARATED BY BLANK; e.g., 100000 1996)
(ENTER 0 IF THIS COST CATEGORY IS NOT APPLICABLE)
OLD VALUE = 85750.00 IN 1997 DOLLARS; ENTER NEW VALUE:

The former value is displayed to help you decide whether to change the value or keep the former value. Simply enter the new value according to the required format and press the carriage return (or **enter** key). If you decide not to change the former value, simply press the carriage return (or **enter** key) without typing any other keys and BEN will keep the former value in its memory. In the case of a cost and year entry, BEN uses both former values. If you want to change a variable, and the prompt requires the dollar-year in addition to the cost entry, enter both values. If you omit the dollar-year entry and enter only the cost, BEN will use the former value for the dollar-year, which is displayed with the former cost value.

If you attempt to change any of the variables between 8 and 13, BEN will print the following message:

ERROR: STANDARD VALUES 8 THROUGH 13 CANNOT BE CHANGED WITH
THE STANDARD VALUE OPTION, ENTER AGAIN:

TYPE NUMBER OF VARIABLE BETWEEN 1 AND 7 TO BE CHANGED
(TYPE 0 FOR NO CHANGE)

0

When you have made all of your changes, type **0** (zero). BEN then asks if you wish to see a listing of the current values for all the variables. This option allows a final check for incorrect entries before recalculating

the economic benefit.

DO YOU WISH TO SEE A LISTING OF CURRENT VALUES? (Y/N)
Y

Typing **N** signals BEN to calculate the economic benefit. Typing **Y** results in a variable listing similar in format to that provided with the output, but including the new entries. After the listing, BEN asks if you want to make any further changes. This option provides the opportunity to correct entries or enter new values that were missed during the first round of changes.

DO YOU WISH TO MAKE ANY FURTHER CHANGES? (Y/N)
N

Typing **N** signals BEN to calculate the economic benefit. Typing **Y** cycles the program back to the change procedure, after which BEN prompts you for the number of the variable to be changed. When you have made all of the changes, type **0** (zero). BEN will again ask if you desire a variable listing and if you want to make any further changes. A negative response to both questions signals BEN to calculate the economic benefit.

After completing the calculation, BEN prompts you to select the output format from the following choices:

PLEASE CHOOSE FORMAT:

- 1 = ANSWER
- 2 = ANSWER PLUS PRESENT VALUE CALCULATIONS
- 3 = FULL OUTPUT WITH CASH FLOW TABLES
- 4 = OMIT OUTPUT
- 5 = DESCRIBE OUTPUT OPTIONS IN DETAIL

This menu is an abbreviated version of the menu presented during the first run. The added Option 5 allows you to see the detailed version shown on page 5-2 before selecting an output format. Selecting options 1, 2, or 3 begins another output printing session. Option 4 skips over the printing. BEN then offers you the

opportunity to do another economic benefit calculation.

2. Changing Values in the User-Specified Mode

DO YOU WISH TO DO ANOTHER ECONOMIC SAVINGS CALCULATION?
(0=NO; 1=YES, USING STANDARD VALUES; 2=YES, USING OWN INPUTS)

2

This section outlines the procedures for changing variable values when variables 8 through 13 are user-specified. Type **2** to indicate that you wish to use nonstandard values.

If your last run employed user-specified inputs, you can change any or all of the thirteen variables. You can make as many changes as desired. If your last run used standard values, BEN first asks for changes to be made to any of the variables between 1 and 7.

TYPE NUMBER OF VARIABLE BETWEEN 1 AND 7 TO BE CHANGED
(TYPE 0 FOR NO CHANGE)

0

When all changes to variables 1 through 7 have been completed, type **0** (zero) to signal BEN that no further changes to these 7 variables are needed. Do not attempt to change variables 8 through 13 at this time or the following error message will occur:

ERROR: CHANGE ONLY VARIABLES 1 THROUGH 7 AT THIS TIME.

YOU WILL AUTOMATICALLY BE PROMPTED FOR VARIABLES 8
THROUGH 13 LATER

TYPE NUMBER OF VARIABLE BETWEEN 1 AND 7 TO BE CHANGED
(TYPE 0 FOR NO CHANGE)

0

A response of **0** (zero) indicates that BEN should begin prompting for the remaining variables:

YOU WILL NOW BE PROMPTED FOR VARIABLES 8 THROUGH 13

8. USEFUL LIFE OF POLLUTION CONTROL EQUIPMENT IN YEARS (e.g., 15)
OLD VALUE = 15 YEARS; ENTER NEW VALUE:

15

Enter the new value for Variable 8 followed by a carriage return (or **enter** key). If the old value printed under the prompt is the desired value, press only the carriage return (or **enter** key) and BEN will keep this value in memory. Note that in most cases where the previous run used standard values, the old values shown in the prompts are the standard values.

9. MARGINAL INCOME TAX RATE FOR 1986 AND BEFORE (e.g., 49.6) =
OLD VALUE = 49.60%; ENTER NEW VALUE:

49.6

10. MARGINAL INCOME TAX RATE FOR 1987 TO 1992 (e.g., 38.6) =
OLD VALUE = 38.6%; ENTER NEW VALUE:

38.6

11. MARGINAL INCOME TAX RATE FOR 1993 AND BEYOND (e.g., 39.4) =
OLD VALUE = 39.4%; ENTER NEW VALUE:

39.4

12. ANNUAL INFLATION RATE (e.g., 1.8) =
OLD VALUE = 1.8%; ENTER NEW VALUE:

1.8

13. DISCOUNT RATE: WEIGHTED-AVERAGE COST OF CAPITAL (e.g., 10.6) =
OLD VALUE = 10.6%; ENTER NEW VALUE:

10.6

Continue entering new values in response to each prompt, or simply press the carriage return (or **enter** key) to retain the old values.

Be sure to maintain the required relationships between variables. For example, the inflation rate cannot exceed the discount rate. BEN checks for these types of errors after all changes have been made. See Chapter 3 for examples of the error messages that BEN provides.

DO YOU WISH TO SEE A LISTING OF CURRENT VALUES? (Y/N)

Y

After you have entered all the information and BEN has checked for errors, BEN asks whether you desire a listing of the variables and their current values.

DO YOU WISH TO MAKE ANY FURTHER CHANGES? (Y/N)

N

Typing **N** signals BEN to begin recalculating the economic benefit. Typing **Y** yields a listing of the former values that were left unchanged and the new values you just entered. BEN then asks if any further changes are desired.

TYPE THE NUMBER OF VARIABLE TO BE CHANGED
(TYPE 0 FOR NO CHANGE)

0

After all changes have been made (by either entering new values or by pressing the carriage return (or **enter** key) to use the former values), enter **0** (zero) to end the change session. BEN again checks for errors, asks if you want a variable listing, and asks if you want to make further changes. A response of **N** to both questions signals BEN to recalculate the economic benefit using the new values.